

Introduction

The Los Angeles Fire Department (LAFD)'s Computer Aided Dispatch (CAD) system is a transactional, event-driven system that records dates and time stamps based on events triggered by two distinct human interactions: interaction with CAD at the dispatch center via CAD workstation, and interaction with CAD via the Mobile Data Computer (MDC) installed in the responding LAFD unit, communicating with CAD through the LAFD's Radio Network Controller (RNC).

Operationally, the LAFD's E9-1-1 system uses a Digital Voice System (DVS) to speed up the call-processing and dispatch operations. Under normal operations, the LAFD's E9-1-1 system operates under DVS Phase II. The benefit of DVS Phase II operations is that the dispatch process (fire station alerting: voice, data and phone notifications) gets started automatically before call-taker terminates the call.

All dispatch processing is done manually under DVS Phase I or DVS Off operations.

Purpose and Intended Audience

The purpose of this guide is to provide the basic information needed to understand the LAFD's incident as response data. The intended user needs to have some familiarity with basic database concepts (cardinality, normalization, parent-child relationships, etc.) and some level of familiarity using the Structure Query Language (SQL) to be able come up with valid results.

LAFD's CAD Repository

The LAFD's CAD database is a secured system that is not accessible outside its own environment. A replicated subset of tables dealing with Fire or EMS incidents called into the LAFD's e9-1-1 system, and their related responses are copied to a database repository to provide external access to the replicated information. Data tables in the database repository are replicated automatically from CAD every 2 minutes or less. The replicated database is known as MISDATA and managed and maintain by the LAFD's Dispatch Systems Support Section (DSSS).

LAFD's Incident/Response Processing

The LAFD's approach to processing requests for Fire/EMS services is basically broken down into two distinct components: an incident and its related response(s).

In a very simplified view, an incident deals with those events that are related to the call-processing procedures (from the time LAFD's e9-1-1 is notified of a request for services to the time LAFD resources are notified and dispatch to the location where the event requiring LAFD's involvement has taken place).

During the call-processing handling, a number of time stamps are automatically captured by CAD via computer-trigger mechanisms. The typical steps involved during the call-processing phase are the following:

1. **CALL TRANSFER:** The Primary Safety Answering Point (PSAP), LAPD, receives the initial 9-1-1 call and transfers Fire/EMS related calls to the LAFD's e9-1-1 (located at the Metro Fire Communications [MFC] center for further processing. CAD captures the transfer time into a database field (time stamp: INITIAL_911_TIME) in its database. The call is routed to queue in the Automatic Call Distribution (ACD) application that routes the call to the first available LAFD call-taker.
2. **INCIDENT CREATION:** The call-taker is presented with the call and takes charge of the call and creates an incident record in CAD (time stamp: CREATION_TIME). During this process, the call-taker verifies the address information and interrogates the caller to find out what the nature of the call.
3. **INCIDENT SUBMISSION (TO QUEUE):** Once the call-taker has verified the incident location and nature of the incident, the incident is submitted to a queue (time stamp: PEND_TIME) where the LAFD's resource controller for further processing.

It must be noted that, as mentioned earlier, under normal operations the LAFD's e9-1-1 system is operates on DVS Phase II mode, and under this condition, the execution of the PEND command triggers the initiation of the DISpatch process (unit assignment, alerting system, etc.), thus expediting the dispatch process.

4. **INCIDENT DISPATCH:** The resource controller can retrieve (GET, time stamp: GET_TIME) an incident from the queue to review and manually start the dispatch protocols. The execution of the DISpatch command (DISPATCH_TIME) triggers the mechanisms to start the dispatch protocols.

In similar fashion, a response deals with events that are related to dispatching resources to the scene of the incident (turn-out, on-scene, etc.). The typical steps involved during the call-processing phase are the following:

1. **LAFD FIRE STATION NOTIFICATION:** CAD automatically captures the time a fire station is notified and provided dispatch instructions via the LAFD's Fire Station Alerting System. CAD stores the time dispatch notification is made in its database (time stamp: WRS_TIME). Notification is simultaneously made via FAX, DATA, and AUDIO to the responding unit(s).

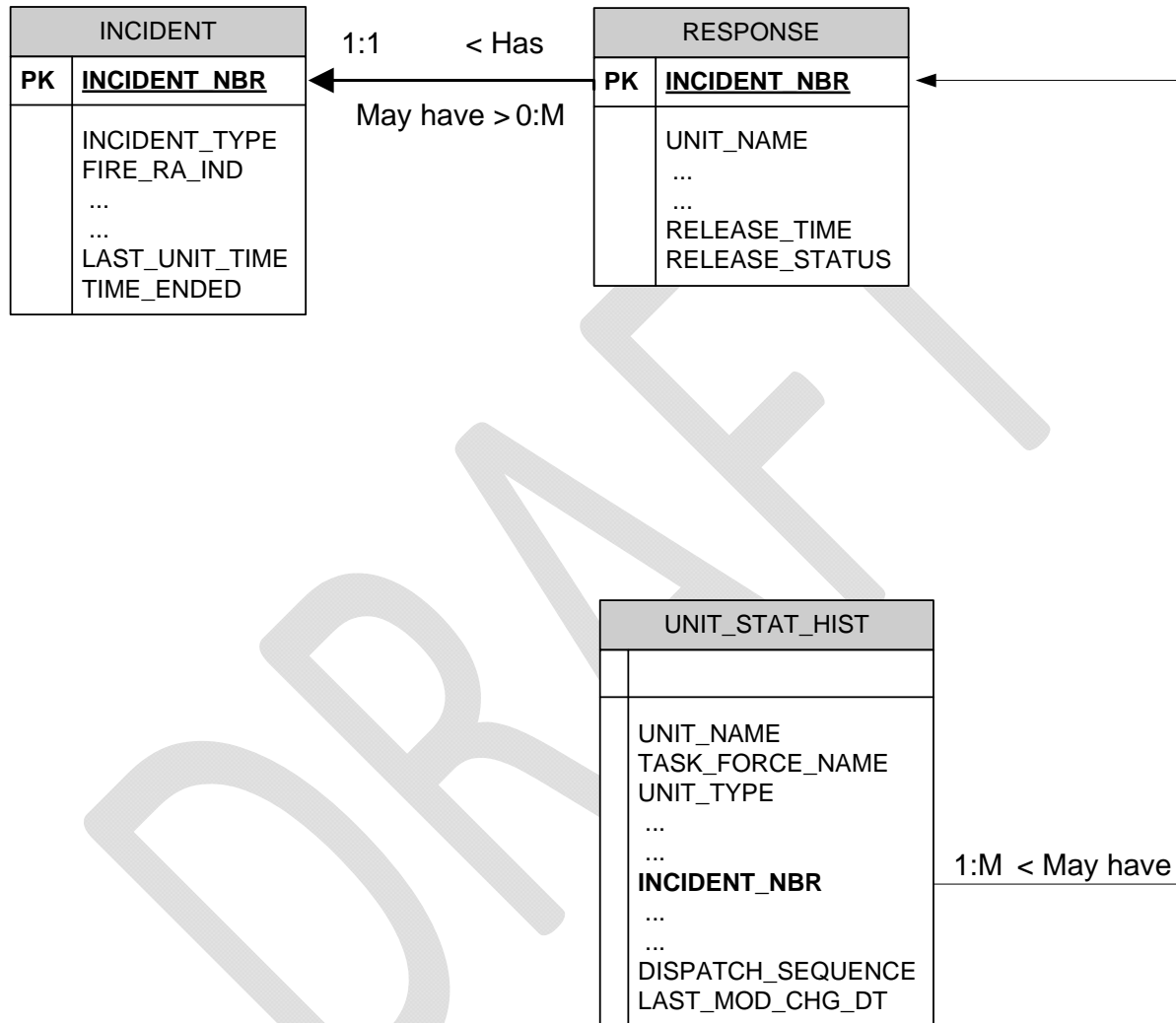
2. RESOURCES IN-ROUTE: CAD captures the time when LAFD resources leave quarters (time stamp: ENR_TIME) by storing the time in which the corresponding function key is activated (pressed) at the resource's Mobile Data Computer (MDC).
3. RESOURCES ON-SCENE: CAD captures the time when LAFD resources arrive at the scene of the incident (time stamp: ONS_TIME) when the corresponding function key is activated (pressed) at the resource's Mobile Data Computer (MDC).
4. PATIENT TRANSPORT TO HOSPITAL: CAD captures when a transport-capable LAFD unit (Rescue Ambulance) transports (time stamp: TSP_TIME) a patient to a designated medical facility when the corresponding function key is activated (pressed) at the resource's Mobile Data Computer (MDC).
5. RESOURCES ARRIVE AT HOSPITAL: CAD captures when a transport-capable LAFD unit (Rescue Ambulance) arrives (time stamp: HSP_TIME) to a designated medical facility when the corresponding function key is activated (pressed) at the resource's Mobile Data Computer (MDC).
6. RESOURCES BECOME AVAILABLE FOR DISPATCH: CAD captures the time when a resource becomes available (time stamp: AVI_TIME) for dispatch via radio. The time is stored when the corresponding function key is activated (pressed) at the resource's Mobile Data Computer (MDC).
7. INCIDENT/RESPONSE TERMINATION: CAD time-ends an incident automatically 5 minutes after the last unit has left the incident. Under certain scenarios (such as when an incident is created but no resources are ever attached to it) an incident can be manually ENDED by a supervisor.

It must be noted that items 2 through 6 (and 7 under certain circumstances) listed above require user interaction for CAD to be able to capture and store the respective time stamp, and as such, the accuracy of those time stamps depends on the timeliness of when the user decides to activate the respective function key.

Another time stamp of interest is LAST_UNIT_TIME: This is the time when the last unit assigned to an incident is released from the incident.

Database Schema

The following diagram shows the tables used by LAFD to view and report information about incident/response activities:



For simplicity only the main tables are shown. A number of reference tables (lookup tables) are used to textual description of codes used to describe unit types, incident types, etc,

Incident Table (CAD Source Table: dispatch.incident)

The image shows a 'Single Record View' window from a CAD system. It contains a list of fields and their corresponding values for a specific incident. The fields are arranged vertically, and some have dropdown menus indicated by three dots. The values are as follows:

Field Name	Value
INCIDENT_NUMBER	200701010011
INCIDENT_TYPE	6D1A
FLRE_RA_TYPE_IND	RA
ST_NUM	8811
ST_DIRPREF	S
ST_NAME	CENTRAL
ST_TYPE	AV
COMMUNITYCODE	MET
MAP_CD	566.3382
INITIAL_911_TIME	01-JAN-07 12.04.17.000000000 AM PST
CREATION_TIME	01-JAN-07 12.04.49.000000000 AM PST
PEND_TIME	01-JAN-07 12.05.45.429161000 AM PST
GET_TIME	01-JAN-07 12.14.03.240459000 AM PST
DISPATCH_TIME	01-JAN-07 12.05.45.686607000 AM PST
ONSCENE_TIME	01-JAN-07 12.10.35.214481000 AM PST
LAST_UNIT_TIME	01-JAN-07 12.55.00.712476000 AM PST
TIME_ENDED	01-JAN-07 01.00.10.714576000 AM PST

At the bottom of the window are three buttons: 'Help', 'Apply', and 'Cancel'.

Response Table (CAD Source Table: dispatch.incident_unit)

The image shows a 'Single Record View' window with a blue title bar and a close button. Below the title bar are navigation arrows. The main area contains a list of fields with their values. At the bottom are 'Help', 'Apply', and 'Cancel' buttons.

Field Name	Value
INCIDENT_NUMBER	200701010011
UNIT_NAME	RA25
DISPATCH_SEQUENCE	2
DISPATCH_STATUS	QTR
DISPATCH_RFS	25
WRS_TIME	01-JAN-07 12.05.45.700897000 AM PST
ENR_TIME	01-JAN-07 12.07.16.514189000 AM PST
ONS_TIME	01-JAN-07 12.25.20.369302000 AM PST
TSP_TIME	01-JAN-07 12.34.51.528547000 AM PST
HSP_TIME	01-JAN-07 12.43.04.095518000 AM PST
AVI_TIME	01-JAN-07 12.55.00.697693000 AM PST
RELEASE_TIME	01-JAN-07 12.55.00.699328000 AM PST
RELEASE_STATUS	NAV

Unit Status History Table (CAD Source Table: resources.unit_stat_hist)

Single Record View

Navigation: << < > >>

UNIT_NAME	E65	...
TASK_FORCE_NAME		...
GROUP_NAME		...
UNIT_TYPE	E	...
PARAMEDIC_ATTR	EMT	...
DFLT_PMEDIC_ATTR	EMT	...
STATUS_CHG_DT	01-JAN-07 12.05.09.485210000 AM PST	
UNIT_STATUS	WRS	
RFS_NBR	65	
ACTUAL_RFS_NBR	65	
INCIDENT_NBR	200701010011	
INCIDENT_DISTANCE	1.8	
LOCKED_INCID_NBR		
LOCKED_DIST		
ON_INCIDENT_IND	N	
ON_MOVEUP_IND		
TF_SPLIT_IND	N	
MDT_DISABLED_IND	N	
QTR_DISPATCH_IND	Y	
DEST_RFS_NBR		
DIPATCH_SEQUENCE	1	
LAST_MOD_CHG_DT	01-JAN-07 12.05.09.487686000 AM PST	

Buttons: Help Cancel

Filters

1. The basic filter for extracting valid incidents:
UNIT_STATUS = WRS AND
INCIDENT_TYPE IS NOT NULL AND
UNIT_NAME IS NOT NULL AND
UNIT_NAME NOT EQUAL TO BS
2. Call Processing:
INITIAL_911_TIME IS NOT NULL AND DISPATCH_TIME (WRS_TIME) IS NOT NULL
3. Turn-out time:
INITIAL_911_TIME IS NOT NULL AND ENR_TIME IS NOT NULL
4. Travel time:
ENR_TIME IS NOT NULL AND ONS_TIME IS NOT NULL

Notes:

- A. The initial_911_time time stamp is only captured when a call (wireless or landline-based) comes into the LAFD's e9-1-1 center through the 9-1-1 system. For incidents where there is no initial_911_time, the creation_time time stamp is used instead as the beginning of call processing.
- B. Blank time stamp fields is NOT an indication of corrupted data. Blank fields are an indication that the call did not go thru the typical process. Examples of such incidents are STILL alarms, adding resources to an ongoing incident, etc.
- C. Time stamps that appeared to be reversed are not uncommon, and require detail analysis to find out the underlying operational conditions at the time the incident was created. Being in DVS Phase II mode is an example of an operational condition that may result in such "bad" data because resources are dispatched ahead of time. Date-time changes due to "springing forward" or "falling back" cause time stamps to look corrupted as well.

Exclusions

1. **Manual Mode Processing**
2. **Non Emergency dispatched incidents**
3. **Incidents where CREATION_TIME/WRS_TIME TO ONS_TIME GREATER THAN ...**
4. **...**
5. **... We need to come up with a listing of what to exclude!!!**
6. **Do we need to address what data is being removed because of HIPPA?**

Definitions

Pre MCP (Before MCP)	July 2008 – July 2009
MCP (Modified Coverage Plan)	Aug 2009 – Dec 2010
E MCP (Expanded MCP)	Jan 2011 – June 2011
DP (Deployment Plan)	July 2011 – Oct 2011
Goal	National Fire Protection Agency (NFPA) Standard expressed in two measurements: <ol style="list-style-type: none"> 1. Average time target 2. Percentage, that the time target is met
N	Number of observations
ALS	Set of life-saving protocols and skills that extend Basic Life Support to further support the circulation and provide an open airway and adequate ventilation (breathing). Also defined as "Paramedic".
BLS	The level of medical care which is used for patients with life-threatening illnesses or injuries until the patient can be given full medical care at a hospital. BLS generally does not include the use of drugs or invasive skills. Also defined as "Emergency Medical Technician" (EMT)
Engine	Pumper apparatus that includes hose, water tank, and 4 personnel trained to the EMT level
ALS Engine	Pumper apparatus that includes hose, water tank, and 4 personnel, one of which is trained to the level of paramedic.
Truck	Aerial ladder truck that includes ladders, extrication, ventilation and water removal tools. Trucks are staffed by 5 personnel trained to the EMT level.
ALS Truck	Same as a truck, however, at least one member is trained to the level of paramedic.
Light Force	An aerial ladder truck that includes ladders, extrication, ventilation, and water removal tools in conjunction with a pumper that includes hose and a water tank. The light force is staffed by 6 personnel trained to the EMT level.
ALS Light Force	Same as a light force, however, at least one member is trained to the level of paramedic.

BC Battalion Chief. First response command unit

Measurements

- A. Call Processing Time** The time it takes from receipt of the 911 call to time of dispatch
- Time Goal: 2:00 minutes
- % Goal: 90%
- B. Dispatch to Enroute of First Arriving Unit** Time measurement, from time that alarm is transmitted, until the time that the first arriving resource arrives starts moving toward the incident
- Time Goal: 1:00 minute
- % Goal: 90%
- C. First Dispatch to First Resource On Scene** Time measurement, from time that alarm is transmitted, until the first arriving resource arrives at the incident.
- Time Goal: 5:00 minutes
- % Goal: 90%
- D. First Dispatch to First ALS Resource On Scene** Time measurement, from the time alarm is transmitted, until the unit that is advanced life support (ALS) capable arrives at the incident.
- Time Goal: 8:00 minutes
- % Goal: 90%
- E. First Dispatch to First Transport On Scene** Time measurement, from the time alarm is transmitted, until the first transport capable unit arrives on scene
- Time Goal: 9:00 minutes
- % Goal: 90%
- F. First Dispatch to First BC On Scene (EMS)** Time measurement, from the time alarm is transmitted, until the first Battalion Chief arrives on scene at an EMS incident

Incident)

G. First Dispatch to First Engine On Scene	Time measurement, from the time alarm is transmitted, until the first Engine arrives on scene at a non-ems incident.
	Time Goal: 5:00 minutes
	% Goal: 90%
H. First Dispatch to First Truck On Scene	Time measurement, from the time alarm is transmitted, until the first Truck (or Light Force) arrives on scene.
	Time Goal: 9:00 minutes
	% Goal: 90%
K. First Dispatch to First BC On Scene	Time measurement, from the time alarm is transmitted, until the first Battalion Chief arrives on scene.
	Time Goal: 9:00 minutes
	% Goal: 90%

Miscellaneous questions/answers**1. How incidents are properly classified and filtered?**

Incidents are first classified as Fire or EMS (Incident table field: FIRE_RA_TYPE_IND). Once the incident has been identified as being a Fire or EMS related incident, a determination is made through the phone interaction between the caller and the call-taker, then, the incident is classified accordingly to one of the valid incident types (see INCIDENT_TYPE_REF file) the LAFD has approved.

2. Why does the incident table contain dispatch times that come after the on-scene time?

To be able to capture the correct on-scene time, one must read the ONS_TIME field from the unit_status_hist (unit_stat_20070101_20120326) table. This particular true of incidents with multiple units responding to it.

3. How is the incident-type field filtered down to the subset of EMS calls that qualify for evaluation against the 5 minute standard?

The basic criteria for extracting valid incidents is as follows:

- A. UNIT_STATUS = WRS
- B. INCIDENT_TYPE NOT NULL
- C. UNIT_NAME IS NOT NULL
- D. UNIT_NAME <> BS

There are other sets of parameter used depending on the type of report, but the parameters listed are the basic ones used. For instance, ONS_TIME NOT NULL is used to filter out units that may have been cancelled while en-route to the incident.

4. *Besides filters on the incident_type field, what other exclusions, joins, or other adjustments has LAFD made to generate their top-level EMS response time number?*

Again, it all depends of the information needs. CAD uses a combination of incident type, skills and algorithms to recommend units to be dispatched.